Fundamental Positions for Instrumental Musicians

(Third of a Series of Three Articles)

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Often it is the study of pathologic alterations that leads one to an understanding of the normal state. It is by this means that our work at the Ecole Normale de Musique of Paris and the observations we have made on more than 200 musicians have led us to the conclusions presented here about healthy physiologic postures used by instrumental musicians.

For musicians it should not be a new concept that solid support allows freedom of fine movement. This is basic to wind instrumentalists and vocalists, who learn very early the importance of the air column. Our purpose here is to clarify essential points of postural support that are not always obvious.

The fundamental positions described in this article create a desired posture with minimum stress on the body and with minimal energy expenditure. This principle is important for everyday life and becomes critical for those who stress the system by demanding fine, repetitive, highly specific maneuvers such as those required by musicians.

To remain upright, the body must counteract the force of gravity, and it must provide stability while allowing movements, some of which require fine control. The body accomplishes this through a skeletal and ligamentous framework that is acted on by a system of agonist and antagonist muscles. These muscles, which have opposite effects on a given joint, work in concert to create controlled movement or stationary, although not rigid, positions. Deviations from strictly physiologic positions are frequent but must be momentary, followed by a rapid return to the physiologic baseline. Wide variations in technique for a given instrument may be apparent in terms of physiologic demand, but if examined closely they will be found to follow the basic principles.

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This interplay between antagonist and agonist muscles and the skeleton creates a dynamic equilibrium that is modulated at various levels in the brain. The cortex is responsible for consciously controlled movements, whereas the subcortical areas control automatic movements. Maintenance movements such as posture, and for instrumentalists positioning of the upper and lower extremities, should be automatic, thus freeing the consciousness for other tasks.

Dysfunction occurs when this dynamic equilibrium and its control are disrupted. Although the musician may note a problem of the hand or fingers, it is likely that the problem originates in a much higher center; the bad habits that have been incorporated at an unconscious cerebral level cause a modification of the normal movements of all the muscles of the upper extremity and possibly the entire body.

Consequently, it is important to have a clear understanding of the concepts behind the fundamental positions, beginning with basic posture, before proceeding to a discussion of specific positions for a particular instrument. It also becomes obvious that to attempt to adopt the gestures of the often eccentric masters without fully analyzing their entire patterns of positioning can lead to problems.

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Posture

Basic to all instrumentalists is posture, whether standing or sitting. Posture supports the body weight, the anteriorly placed arms, and the instrument, or in the case of keyboards, the resistance against the fingers from the instrument.

In the standing position the mass of the body falls in the center of a polygon of support defined by the position of the feet. Ideally, the distance between the feet should be in between that of the width of the pelvis and the distance between the shoulders. They should also form an angle of about 80° opening forward. These relationships hold even if one foot is slightly ahead of the other.

The feet themselves should be flat on the floor, providing the normal stable tripod formed by the base of the great toe, the base of the little toe and the heel. The hips and knees are extended and the pelvis is held in retroversion (tilted back), a position that requires abdominal muscle tone. Holding one foot slightly in front of the other facilitates this pelvic position and can partially compensate for weak abdominal muscles.

With the pelvis correctly positioned and the head held straight, the spine naturally falls into straight alignment. This frees the rib cage, which is necessary for free respiration—important to all but critical for wind instrumentalists and vocalists.

The seated position is inherently more stable. The supports for body weight are the ischia of the pelvis, the thighs on the chair, and the feet on the floor. Again, with proper head and pelvic position the spinal alignment follows naturally. Some anterior-posterior motion occurs by rocking the pelvis through the hip joints, and rotation of the hip joints allows some side to side motion. The axis through the shoulder joints and the transverse axis through the pelvis should remain parallel to the floor, which requires a flexible spine. The additional stability provided by the feet is modified when they must be used for pedaling.

All instruments require that the arms be held in front of the plane of the body. Therefore, the weight of the arm and often that of the instrument as well must be supported proximally. The anatomical area usually referred to in lay terms as the shoulder is in reality two joints—the scapulothoracic girdle and the glenohumeral or true shoulder joint. The scapulothoracic girdle is suspended from the axial skeleton (i.e., the spine, rib cage and pelvis) by powerful muscles and through a bony chain via the clavicle to the thorax. The scapulothoracic girdle is the major muscular buttress supporting the arm, and therefore the instrument, on the axial skeleton and is also responsible for positioning the shoulder axis. Better stability for and greater freedom of movement of the arm at the glenohumeral joint is obtained with lateral gliding and posterior rotation of the scapula. Without proper support and positioning at this level, fine control of hand movements is extremely inefficient and may be impossible. The shoulder joint itself positions the arm in space, in accord with the variable requirements for each instrument.

We will consider in detail the positioning of the upper extremities in the pianist, violinist, and guitarist. These will serve as representative examples and the principles learned can be extrapolated to other instruments.

The Pianist

The arms of the pianist are always in front of the plane of the body (anteposition). As they sweep along the keyboard they move away from its center, movement being made possible through shoulder abduction, adduction, and external rotation. Scapulothoracic motion contributes as well, as it separates the arm as much as possible from the axis of the body through upward and outward gliding of the scapula.

The forearm is in partial pronation with its transverse axis above the wrist forming an angle of approximately 30° with the keyboard. The hand itself is in complete pronation, thus creating a volar arch that increases the force in the fingers and allows maximum contact of the pulps of the fingers with the keys. The axes of the hand and forearm form an angle of 15° to the ulnar side and the wrist is in slight extension. This position allows more efficient finger flexion as it puts the extrinsic tendons in the ideal physiologic axis. Playing of staccato passages is facilitated by slight wrist flexion which is accompanied by finger extension.

Each finger has independent motion but must be constantly reequilibrated with the entire hand. This equilibrium is maintained through preservation of the longitudinal and transverse arches of the hand, which were explained in the first article of this series. The concept of agonist and antagonist muscles again becomes critical. At the wrist, the synergistic contraction of the extensor carpi ulnaris (ECU) and abductor pollicis longus is of primary importance for stabilization of the arch between the thumb and fifth finger (note that with pronation the ECU acts solely as an ulnar deviator and not a wrist extensor). Also, when the thumb reaches to strike a note, the ulnar side of the hand reacts to avoid flattening the arch by flexing the fourth and fifth metacarpals.

Before touching the keys, finger flexion commences in a physiologic sequence beginning with the proximal interphalangeal (PIP) joint followed by the metacarpophalangeal (MCP) joint and lastly by the distal interphalangeal (DIP) joint. Flexion of the proximal phalanx of the index finger occurs in slight abduction without rotation. With a well-positioned index finger, the proximal phalanx of the middle finger will also demonstrate radial abduction with flexion. With flexion the ring and small fingers abduct as well but the motion is to the ulnar side of the hand. Thus, the fingers are spread apart contributing to the stability of the hand and maintenance of the metacarpal arch. The finger curvature created by the normal sequence of flexion is especially important in the ring and small fingers to prevent their rotation in supination.

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ment of the finger with its metacarpal bone, and with well-coordinated action of the extrinsic and intrinsic muscles.

The thumb has an important role in stabilizing all the arches because of its strength throughout its wide range of motion, especially in forward position and radial abduction. Extension of the thumb, which is employed to remove it from the key after striking a note, combats the tendency for hyperpronation of the thumb pulp.

The Violinist

Unlike the arms of a pianist, those of the violinist have quite different functional requirements and consequently different positions. The instrument is supported in the clavicular hollow on the left. The head turns to that side and is just barely inclined toward the body of the violin in order to support it. Scapulothoracic positioning is extremely important here, as the position of the inferior angle of the scapula against the rib cage at the end of its physiologic sliding seems to be an essential element to the resistance of the weight of the arm and of the instrument.

The arm is in nearly complete external rotation, facilitating complete supination of the forearm. The wrist remains free and varies in position from flexion when there is finger extension, to slight extension when the fingers are flexed. The normal inclination of the wrist is 15° to the ulnar side.

The thumb is maximally spread apart from the hand opposite the middle finger, forming a fork that permits free gliding of the hand along the neck of the violin.

The fingers are placed on the strings so that maximal pulp contact is achieved. Episodic axial rotation of a finger improves the contact. When contact with the string is relaxed, the finger returns to its normal flexed position.

On the right side, the placement of the scapulothoracic girdle is as important as on the left, although often it is given less attention by the violinist. It should be at the same height as on the left, and the frontal and sagittal alignment should be identical. This can cause curvature of the spine, which is compensated for by carrying the head as straight as possible.

The right arm is in internal rotation. If the bow strikes at its tip, the arm is also in abduction; if the stroke is at the frog of the bow, the arm is in anteposition.

Depending on the technique the forearm is in complete or slightly less than complete pronation. The wrist remains free but stable and moves through a wide arc of motion with a limited amplitude.

The transverse and longitudinal arches are well maintained in the right hand. The fingers are all moderately flexed and the thumb is in forward position, opposing the long finger in order to support the weight of the bow. The force of the pinch between the long finger and the thumb should be minimal, as its purpose is to precisely define the trajectory of the bow. The ring and small fingers guide the bow as well as balance the metacarpal arch. The index finger has a special role, that of steadying the bow and modulating the sound by changes in pressure. It is held in varying degrees of flexion according to the technique.

The Guitarist

There are many different styles and techniques for guitar playing. We will restrict our comments to the classical guitarist.

The classical guitarist is generally seated with the left foot lifted to rest on a footstool. [Left thigh is elevated when foot is on stool.] The trunk leans forward approximately 30°. The plane of the scapular girdle remains parallel to the pelvis despite the elevation of the left thigh. The two shoulders are at the same level and the arms held in front of the body. As in the violinist, the left arm is in external rotation and the forearm supinated. Flexion of the elbow with contraction of the biceps helps to maintain this supination.

The left wrist is inclined 15° to the ulnar side to align the tendons of the extrinsic muscles and remains free in flexion-extension to compensate for finger movements. Again, the arches of the hand, especially the transverse metacarpal arch, must be maintained. The pulps of the fingers are in contact with the strings.

The neck of the guitar should be free between the thumb and the fingers in the first web space. The thumb is in extension at the MCP joint and in no more than slight flexion at the interphalangeal (IP) joint. It is mobilized through the trapeziometacarpal joint to oppose the index and middle fingers, forming a tripod for the guitar. The instrument should be well balanced by the support of the thigh, the weight of the right arm, and this tripod, allowing freedom of movement of the left hand along the neck.

The fingers execute simultaneous, physiologically contradictory combinations of movements. However, these should not make the guitarist lose the equilibrium of the arches of the hand, which is maintained mostly by coordination between the intrinsic and extrinsic muscles.

The right arm of the guitarist is in forward position, abduction and internal rotation. The elbow is flexed and the forearm rests on the body of the guitar in neutral pronation-supination. The wrist is in ulnar inclination and flexed so that the fingers can strike the strings. This flexed wrist position is due to the forearm resting on the distal curve of the guitar. The farther the right forearm is from the body of the guitar, the more the guitarist will flex the wrist and extend the fingers.

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There is wide diversity in the attack of the fingers of the right hand. The methods for "strum" and "pluck," and whether the radial or ulnar side of the finger is used to effect the stroke all depend on the technical school. However, many of the positions created are nonphysiological.

The right thumb plays in opposition to one of the other fingers, except the small finger. Thumb motion is initiated at the trapeziometacarpal joint. The IP and MCP joints are supple and usually extended. The morphology of the thumb sometimes necessitates MCP joint flexion, especially if the latter is lax. A wide opposition movement used to develop the thumb stroke is indispensable.

The other finger strokes are of two different varieties. For strum, the movement begins at the MCP joint, whereas the other phalanges remain stable in slight flexion (20° for the PIP joint and 10° for the DIP joint). For pluck, flexion at the PIP joint is produced by the flexor digitorum superficialis.

Because of both position and technique, the guitarist has a greater variety of inherently antiphysiologic gestures than do most other instrumentalists. The guitarist must attempt to approach physiologic positions as often as possible and to return to physiologically coordinated states as quickly as possible after unnatural movements.

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Conclusion

The principles discussed in this article pertaining to dynamic equilibrium, posture, respiration, and projection of the arms apply to string, percussion, and wind instrumentalist alike. Each instrument has particular requirements, notably in the placement of the fingers, and each technique will require variation. However, the basic musculoskeletal physiology should be respected whenever possible.